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THE AUSTRALIAN HONEY-ANTS OF THE GENUS LEPTOMYRMEX MAYR.

By William Morton Wheeler.

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Little study has been devoted, either by the European systematists or the field naturalists of Australia, to the singular ants of the genus *Leptomyrmex*. I have therefore undertaken to record such observations as I was able to make on these fascinating insects during a brief visit to New South Wales and Queensland in the latter part of 1914, and at the same time to summarize what was previously known about them from the scattered sources, in the hope that some of my entomologist friends in Australia may be induced to make a more exhaustive study. The species of *Leptomyrmex*, unlike so many Australian ants, are perfectly harmless and would, no doubt, live well in artificial nests of rather simple construction. The entomologist who could devote a little patient study to these insects under such conditions would unquestionably be rewarded by obtaining answers to some if not to all of the questions suggested in the following pages.

The worker *Leptomyrmex* is easily recognized by the extraordinary attenuation and elongation of all parts of the body, except the abdomen. Curiously enough, both the petiole and the gaster show only a slight tendency to elongation, in marked contrast with the very slender legs and antennæ. Emery [2] regards the genus as constituting by itself one of the four tribes of the subfamily Dolichoderinæ, the principal distinctive characters being the great attenuation of the head, thorax and appendages, the rather soft and flexible integument, the peculiar structure of the proventriculus, the distinct separation of the antennary and clypeal fossæ, and the very aberrant venation of the fore wings of the male.

The proventriculus of *L. erythrocephalus* has been studied by both Forel and Emery. The former figures the organ *in toto*, the latter

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1 Contributions from the Entomological Laboratory of the Bussey Institution, Harvard University, No. 89.

2 Genera Insectorum, Fasc. **137**, 15 et seq. (1912).

figures a series of transverse sections through its anterior and posterior portion. The accompanying sketches (Figs. 1 and 2) represent the organ in *L. nigriventris* and *unicolor*. In both species it is hard and of a glassy texture, as Emery observed, and its four valves (v.) are large, with rounded, lobe-like, anterior ends. Their inner surfaces appear to be very hairy, especially along the edges. The bulbous, posterior portion (b.) of the organ is large and rather sharply marked off from the valvular and cylindrical regions (c.). The muscular layer (m.), which seems not to have been seen by Emery, is well-developed,

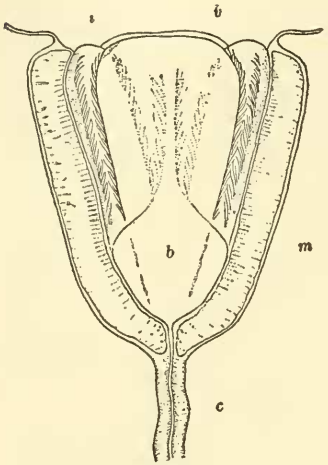

Fig. 1

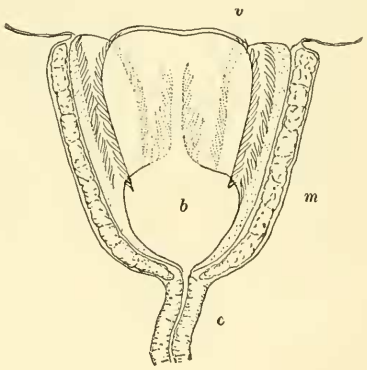

Fig. 2

FIGURE 1. Proventriculus of *Leptomyrmex nigriventris*, *i*. wall of crop, *v*. valve, *m*. muscles, *b*. bulb, *c*. cylindrical portion.

FIGURE 2. Preventriculus of *Leptomyrmex unicolor*. *v*. valve, *m*. muscles, *b*. bulb, *c*. cylindrical portion.

especially in *nigriventris*. In *unicolor* this layer is much feebler and the whole organ is shorter and smaller.

No other Dolichoderine ant has a proventriculus of the same type as that of *Leptomyrmex*, though in *Dolichoderus* it is somewhat similar. Since the proventriculus functions as a valve between the ingluvies, or crop and the ventriculus, or true stomach, its very high development in the species of *Leptomyrmex*, as shown by the large size of the chitinous valves and the thick layer of musculature enveloping them, is evidently correlated with the habit in these insects of storing large quantities of liquid food in the crop. This is also indicated by the

fact that in *L. unicolor*, which is probably the only species that does not have this habit, the organ is much smaller, the valves proportionally shorter and the layer of musculature much thinner.

The venation of the fore wing in the male *Leptomyrmex*, too, is unlike that of any known ant (Fig. 3). The pterostigma is reduced to a mere vestige. The radial vein is well developed and with the costa encloses a long, narrow radial cell. The cubitus comes off from the radius and describes a curve, terminating near the tip of the wing. The media is well developed, its terminal portion describing a curve similar to that of the cubitus. There is no cubital or discal cell. The short transverse vein running from the pterostigma to the media is divided into two portions, the anterior of which is regarded by Emery as the base of the radius, the longer, posterior portion as representing a fusion of a transverse cubital with the recurrent nervure. He

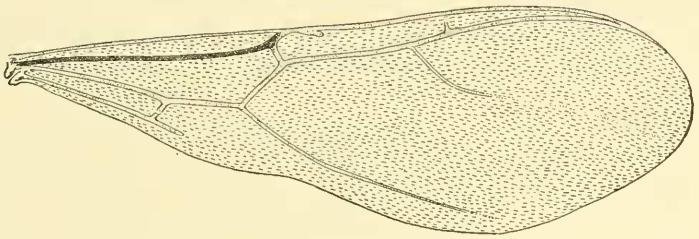

FIGURE 3. Wing of male *Leptomyrmex* sp. from Cooktown, Northern Queensland.

believes, therefore, that the basalis, which is a fundamental cross-vein in the Hymenopteran wing, is completely lacking in *Leptomyrmex*. In support of this view he calls attention to a male ant from the Sicilian amber (Miocene), which he formerly called *Leptomyrmex maravignæ*, but for which he has recently established a new genus, *Leptomyrmula*. This insect is more primitive than *Leptomyrmex* in having a vestige of the basalis arising from the media and in possessing a developed pterostigma.

Another peculiarity of the genus *Leptomyrmex*, to which attention has not been called heretofore, is the absence of a queen, or female caste in any of the known species. At any rate, no one has ever seen a female *Leptomyrmex*. I shall return to this subject in the sequel.

Very few observations have been recorded on the habits of any of the species. Gilbert Turner has published a note on *L. erythrocepha-*

lus which he observed at Mackay, Queensland.[3] He noticed the peculiar position in which the gaster is carried by the foraging worker and discovered that "certain workers in every nest have their abdomen greatly distended by a sweet transparent fluid. These workers are only found at the bottom of the nest, about two feet from the surface; they can move about, but are not as active as the unaltered workers and never leave the nest." Forel [4] says that Turner found this replete condition of the gaster in *L. varians* Emery var. *rufipes* Emery at Mackay. Perhaps this form was erroneously cited as *L. erythrocephalus* in Turner's paper. The only other note I have seen on the habits of Australian *Leptomyrmex* is the following sentence in Lowne's paper [5] referring to *L. erythrocephalus:* "I never saw but one specimen of this remarkable insect alive; it was running upon the ground in the bush; it frequently took a leap of nearly three inches; it does not run so fast as its form would lead one to suppose." As I have seen many *Leptomyrmex* running about and have never seen any of them jump, I am sure that Lowne's statement is erroneous. He must have mistaken some jumping *Myrmecia,* probably *nigrocincta* F. Smith, for a *Leptomyrmex.*

I have found the nests and observed something of the behavior of the following species and varieties of *Leptomyrmex: erythrocephalus, nigriventris, unicolor* and the varieties *rufipes* and *ruficeps* of *varians.* All of these ants, and also the other species of which I have seen only single workers or specimens taken by other collectors (*L. froggatti, wiburdi* and var. *pictus* and *L. varians* var. *rothneyi*) live in the woods and never in open, cleared country. *L. unicolor* is confined to the shady rain-forests ("scrub") of northern Queensland, *L. varians* var. *ruficeps* occupies similar stations in the same region, the var. *rothneyi* and *rufipes* prefer the open *Eucalyptus* forests of the dryer portions of Queensland and *nigriventris, wiburdi* and *erythrocephalus* inhabit similar situations in New South Wales, especially in the Triassic sandstone region of the Blue Mountains.

The nests are either in the ground or in great rotten logs, and although one may readily locate them by carefully following foraging workers, one is often disappointed to find them in situations where they cannot be excavated. When in the ground the nest is usually

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3 Notes upon the Formicidæ of Mackay, Queensland, Proc. Linn. Soc. N. S. W., **22**, 1897, 129–144 (1898).

4 Fourmis Nouvelles d'Australie. Rev. Suisse Zool. **10**, 473 (1902).

5 Contributions to the Natural History of Australian Ants. The Entomologist, **2**, 278 (1865).

under the large roots of some tree, and when in a log, it is nearly always in the very heart. The entrance is large, often an inch or more in diameter, and leads into a gallery varying from a foot and a half to two feet in length. This gallery is frequently broader than the entrance and both in logs and in the ground terminates in a large chamber sometimes 3–5 inches in diameter. In no case did I see the ants excavating, nor did I find any pellets of earth or wood surrounding the entrance of the nest. From this negative observation, the large size of the nest cavities and the very slender and frail stature of the ants, I infer that they do not excavate nests, but simply take possession of cavities that have been made and later abandoned by lizards or small marsupials (phalangers).

Unlike other Dolichoderine ants the *Leptomyrmex* workers forage singly and never in files. They are, in fact, endowed with great initiative and appear to be far and away the most intelligent of the Dolichoderinæ. Their ordinary gait as they move about on their long legs is stately and elegant, but may be greatly accelerated if they are frightened. The appearance of these ants is peculiar owing to the gaster being bent forward over the thorax. In *L. unicolor* the gaster is thrown so far forward that its dorsal surface is applied to the dorsal surface of the thorax as shown in Fig. 12. In the other species the retroflexion is less pronounced, the gaster being carried nearly at a right angle with the thorax or inclined slightly forward (Figs. 5 and 6). While walking or running with the gaster in this position, the insects resemble diminutive motor-cars, so that they have been called by some of the Australians "motor-car ants." The long thorax certainly resembles the body, or tonneau, the turned up gaster the canopy, and in such forms as *erythrocephalus* and *ruficeps* the red head suggests the large head-light of a motor car.

Usually the ants are seen running along or across roads through the woods. They forage mostly on the ground, but do not hesitate to climb trees and shrubs. They are all highly carnivorous. I have seen them capturing and carrying home a great variety of insects (flies, beetles, moths) and even earthworms. The prey is taken into the nest and there dismembered so that its juices can be more readily imbibed. I doubt whether these ants ever attend honey-dew-producing scale-insects or other Homoptera.

In all the colonies which I examined, except those of *L. unicolor*, I found a certain percentage of repletes, i. e. individuals having the gaster so greatly distended with a perfectly colorless liquid, that it was quite spherical, with its intersegmental membrane tensely ex-

panded and separating the dark dorsal and ventral sclerites from one another. *L. unicolor* evidently has not developed this honey-storing habit. In all the other species the individuals which become repletes must begin their development in this direction as soon as they hatch from the pupæ and before their integument has hardened. In several nests I found a certain number of callows that had already become perfect repletes. The repletes of *Leptomyrmex* are not helpless like those of the American *Myrmecocystus mexicanus* and *melliger* and their varieties, but run about easily though not so rapidly as the ordinary workers. They are, however, much more interested in the brood than the ordinary workers. As soon as the nest is disturbed every replete grabs a larva or pupa and makes off with it. If possible they all retire to the ceiling of the innermost nest chamber and there huddle side by side, each quietly holding its larva or pupa in its jaws. Though the ordinary workers occasionally carry away some of the brood, they are conspicuously less interested in this occupation than their replete sisters. Turner states that these individuals do not leave the nest, but on two occasions at Kuranda, Queensland, I found repletes of *L. varians* var. *ruficeps* returning to their nests along a road through the scrub.

Numerous larvæ and in most cases pupæ were found in the nests during October and November, but all the pupæ collected proved to be workers and I saw no males in any of the nests. Moreover, the most careful scrutiny failed to reveal the presence of anything like a queen or female in any of the nests and on several occasions I must have captured the entire colony. Nor was it possible to detect among the workers any individual or individuals that showed signs of functioning as queens of the colony. If winged queens existed they would certainly have been taken by this time, for these ants are rather abundant in many localities in New South Wales and Queensland. I believe, in fact, that no true queens occur in the genus *Leptomyrmex*, but that there are in each colony one or more fertile workers which supply the eggs that develop into workers and males. We have here one of the interesting problems to be solved by the resident Australian entomologist. In this connection I may state that some other Australian ant-genera are peculiar in lacking queens, notably *Rhitidoponera* and *Diacamma*. In still another series of Ponerine genera (*Onychomyrmex*, *Paranomopone* and *Leptogenys*) the queens are wingless and extremely worker-like.

The *Leptomyrmex* larva is very peculiar. That of *L. nigriventris* is shown in Fig. 4a. The head (b) is violin-shaped, with very small,

pointed, vestigial mandibles, showing that the food of the larva is purely liquid and imbibed directly from the regurgitating workers. The sensory papillæ on the maxillæ and labium are well-developed. The body shows three well-marked thoracic and five or six abdominal segments. It is covered with extremely short hairs. The larva of *L. varians* var. *ruficeps* is similar, but the skin is entirely naked. The larva of *L. unicolor* has a short, rounded head (Fig. 4c), much like that of other ant larvæ, though the mandibles are very feebly developed. The body is covered with hairs which are somewhat sparser and stiffer than in *nigriventris*.

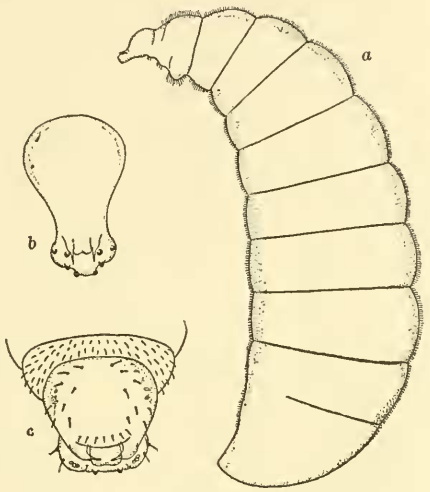

FIGURE 4. *a*. Larva of *Leptomyrmex nigriventris*, *b*. head of same from above, *c*. head of larva of *L. unicolor*.

On disturbing the colonies I found that the ants seldom attacked me with their mandibles, but usually hurried about over my hands, face and clothing like a lot of long-legged spiders, filling the air with the rank, rancid butter, or "*Tapinoma*" odor so characteristic of most species of Dolichoderinæ. This excretion is discharged as a liquid from the anal glands and is so sticky that my skin felt as if it had been varnished. This was especially noticeable after opening nests of *L. varians* var. *ruficeps*. *L. unicolor*, however, emits a more delicate and pleasant modification of the *Tapinoma* odor and the liquid is not discharged in sufficient quantity to make the skin perceptibly sticky. Additional notes on habits are given in connection with the taxonomic descriptions of each of the species and varieties in the latter part of this paper.

I found no myrmecophiles in the nests which I examined, but the following brief notes show that the species of *Leptomyrmex*, like other ants, have their Arthropod guests, enemies and mimics. October 19 on a footpath near Katoomba, N. S. W., I picked up a specimen of

L. erythrocephalus which had a small Dipteran puparium firmly glued to the dorsal surface of its thorax. This puparium had its long axis parallel with that of the ant's body and its anterior end directed toward the ant's head. Unfortunately the fly had already escaped. I am inclined to believe that it must have been one of the Phoridæ. Turner [6] calls attention to a "spider that takes to itself the appearance of a worker of *Leptomyrmex erythrocephalus* Fabr. and curves its abdomen upwards and forwards until it rests on the top of the thorax, exactly the same as the ant," and Rainbow [7] mentions a Misumenine spider which feeds exclusively on *L. erythrocephalus*.

The geographical distribution of the species of *Leptomyrmex* is very suggestive. Of the eight recorded species five (*erythrocephalus, nigriventris, froggatti, varians* and *unicolor*) are confined to Australia, and, so far as known, to the eastern or littoral portion of New South Wales and Queensland, one (*fragilis*) occurs in the Aru Islands and New Guinea, one (*niger*) in New Guinea only, and one (*pallens*) in New Guinea and New Caledonia.[8] Of the Australian species, the typical *nigriventris* and *froggatti* seem to be confined to New South Wales, *varians* and its varieties to Queensland, while *erythrocephalus* ranges over both states. *L. unicolor* is restricted to the Cape York Peninsula of Northern Queensland.

The occurrence of the genus *Leptomyrmula* in the Sicilian amber shows that the tribe *Leptomyrmicii* had once a very wide distribution in the Old World and that the present restriction of the genus *Leptomyrmex* to Papua and Australia is the results of the complete extinction of probably many genera and species of the tribe over the greater part of its former range. The question then presents itself: Did the species of *Leptomyrmex*, like so many of the animals and plants of Eastern Queensland and New South Wales, originate in New Guinea and migrate into Australia, or is it an indigenous Australian genus, which, like some of the Eucalypti, Epacrideæ and phyllodineous Acacias among plants, has spread to New Guinea and New Caledonia? The larger size of the species and their greater number in Australia certainly indicate that this is the center of distribution, but which ever

6 loco citato, p. 136.

7 Descriptions of Some New Araneidæ of New South Wales. No. 8. Proc. Linn. Soc. N. S. W., **22**, 514–533, 2 pls. 1897 (1898).

8 Stitz's recent record of *L. erythrocephalus* from "Newcastle, New Zealand", (Australische Ameisen, Sitzb. Gesell. Naturf. Freunde, Berlin, 1911, p. 368) is evidently a blunder, which Emery has unfortunately cited in the Genera Insectorum as indicating a possible importation of this ant into New Zealand. Newcastle is a flourishing town in New South Wales.

view we take, we are bound to assume that the genus could only have reached its present distribution at a time when land connections existed between New Guinea, Australia and New Caledonia, if I am right in maintaining that winged females do not occur in the genus.

There are, however, still other considerations that point to the origin of the genus *Leptomyrmex* in Australia and the subsequent migration of some of its species to Papua, viz. the development of the honey-storing habit in the different species. I have found repletes in all the Australian species except *unicolor*. *L. pallens* of New Caledonia is known to have repletes, and the same is probably true of *niger* and *fragilis*, although nothing is known concerning the habits of these two Papuan forms. I regard *L. unicolor* as the most primitive species of the genus, because its larva is least modified, because the adult has not acquired the honey-storing habit and because it is confined to the moist coastal "scrub." Nearly all the other forms live in much dryer situations and have evidently developed repletes as a means of tiding over the dry season. We know that this habit has been independently developed in several other Australian ant genera. It has long been known in *Melophorus* species and in a *Camponotus* (*C. inflatus*). I have observed it in several species of *Pheidole* and in an undescribed *Pheidologeton* from Queensland, a genus not hitherto recorded from Australia. In the species of these two genera the soldiers have become repletes, with a very noticeable though not spherical distension of the gaster. Now the Australian botanists have concluded from the differences between the juvenile and adult foliage of the Eucalypti and phyllodineous Acacias that the Australian climate was originally much more humid than it is at the present time. The honey-ants point to the same conclusion, and in *Leptomyrmex* we still find one species, *unicolor* which preserves the ancient habits of the genus and lives only in the coastal rain-forests, while all the other forms have become modified for storing liquid food during protracted periods of heat and drought.

Like most other Dolichoderinæ the species of *Leptomyrmex* are poor in plastic characters. As Emery has shown, they are most easily distinguished by the shape of the head, though some of them present useful characters in the shape of the thorax, petiole, gaster and tibiæ. Sculpture and pilosity are very monotonous throughout the genus. According to my observations, there is very little variation in color among the members of a colony, but several and perhaps all of the species exhibit one or more color varieties. These sometimes form a series from pale to dark forms which may be repeated in another spe-

cies. Thus the typical *erythrocephalus* resembles *varians* var. *ruficeps*, *erythrocephalus* var. *cnemidatus* and *nigriventris* var. *tibialis* resemble *varians* var. *rufipes*, *froggatti* is much like *varians* var. *rothneyi*, etc. Probably many color varieties remain to be discovered in parts of Queensland and New South Wales hitherto unvisited by the entomological collector. The following table may serve for the identification of the workers of the known species and varieties:

1. Head, excluding mandibles, short, less than twice as long as broad; gaster slender, at least three times as long as broad; eyes hairy..... *unicolor* Emery.
   Head longer and narrower; gaster much broader; eyes naked..2.
2. Gaster rufotestaceous, at most with a brown spot on the sides *fragilis* F. Smith.
   Gaster, with at least the two basal segments black.....3.
3. Tibiæ distinctly compressed or flattened.....4.
   Tibiæ not or very slightly flattened.....12.
4. At least the head rufotestaceous.....5.
   Head deep blackish brown..... *froggatti* Forel.
5. Ventral surface of petiole strongly convex, smaller species (7–8 mm.).....6.
   Ventral surface of petiole feebly convex or flattened, somewhat larger species (8–10 mm.).....7.
6. Thorax black, only the sutures red..... *wiburdi* sp. nov.
   Thorax red, with black dorsal spots..... var. *pictus* var. nov.
7. Head narrow, contracted behind.....8.
   Head shorter, broadly rounded behind.....11.
8. Thorax black.....9.
   Thorax rufotestaceous.....10.
9. Mandibles, clypeus and antennal scapes red. *erythrocephalus* Fabr.
   Mandibles, clypeus and antennal scapes black. var. *mandibularis* var. nov.
10. Femora black; tips of antennal scapes brown. var. *decipiens* var. nov.
    Tips of femora black; scapes red throughout. var. *cnemidatus* var. nov.
11. Legs rufotestaceous throughout..... *nigriventris* Guérin.
    Tibiæ and tips of femora black, the former more compressed. var. *tibialis* Emery.
12. Head elongate behind and constricted at the occiput. Length 8.5–10 mm.....13.

Head narrowed behind but not constricted at the occiput. Length 6–8 mm.....16.

13. Thorax entirely or very largely rufotestaceous.....14.
Thorax entirely or largely black or dark brown.....15.

14. Pronotum and sometimes also the mesonotum with a black spot. *varians* Emery.
Thorax entirely rufotestaceous.....var. *rufipes* Emery.

15. Head rufotestaceous.....var. *ruficeps* Emery.
At least the posterior portion of the head black. var. *rothneyi* Forel.

16. Head, thorax and gaster brownish black.....*niger* Emery.
Head or thorax, or both rufotestaceous.....17.

17. Head, thorax, petiole and legs rufotestaceous, gaster dark brown or black.....*pallens* Emery.
Of a different color.....18.

18. Head, excepting the mandibles, black; legs rufotestaceous. var. *nigriceps* Emery.
First two gastric segments black, remainder red, distal halves of femora blackish.....var. *geniculatus* Emery.

1. **Leptomyrmex erythrocephalus** (Fabricius).

(Fig. 5a and b.)

Formica erythrocephala Fabricius, Syst. Ent. 1775, p. 391 ☿ ; Spec. Insect, 1, 1781, p. 488 ☿ ; Mant. Insect. 1, 1787, p. 307 ☿ ; Gmelin. Linné, Syst. Nat. Ed. 13ª 1, 1790, p. 2797; Olivier, Encycl. Méthod. Insect. 6, 1791, p. 491; Fabricius, Syst. Ent. 2, 1793, p. 351; Latreille, Hist. Nat. Fourmis 1802, p. 277 ☿ ; Lowne, Entomologist 2, 1865, p. 278.

Atta erythrocephala Fabricius, Syst. Piez. 1804, p. 423 ☿ .

Formica ? erythrocephala F. Smith, Catalog. Hymen. Brit. Mus. 6, 1858, p. 37 ☿ .

Leptomyrmex erythrocephalus Mayr, Verh. zool. bot. Ges. Wien, 12, 1862, p. 696 ☿ ; Journ. Mus. Godeffroy 12, 1876, p. 77 ☿ (in part); Forel, Bull. Soc. Vaud. Sc. Nat. (2) 15, 1878, Pl. 23, Fig. 9; Emery, Bull. Soc. Ent. Ital. 15, 1883, p. 147, ♀ Fig. 3; Ann. Mus. Civ. Stor. Nat. Genova (2) 4, 1887, p. 252; Dalla Torre, Catalog. Hymen. 7, 1893 p. 162; Emery, Ann. Soc. Ent. Belg. 39, 1895, p. 351 ☿ ; Froggatt, Agric. Gaz. N. S. W., Sept. 1905, p. 23; Stitz, Sitzb. Ges. Naturf.

Freunde Berlin, 1911, p. 368 ♀ ; Emery, Genera Insect. Fasc. 137, 1912, p. 16, Pl. 1, Fig. 4.

Leptomyrmex erythrocephalus? Emery, Mem. Accad. Sci. Bologna, (5) 1, 1891, p. 578 ♂, Pl. 2, Fig. 23.

Worker. Length 9–10 mm.

Head, excluding the mandibles, twice as long as broad, with the eyes half way between its posterior border and the anterior border of

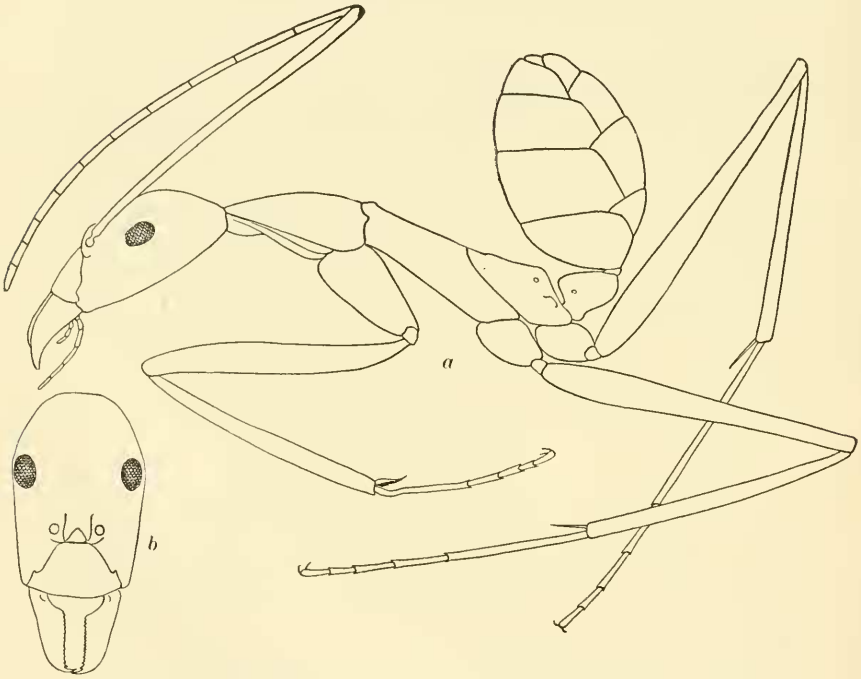

FIGURE 5. *a. Leptomyrmex erythrocephalus* Fabricius. Worker with gaster in position in which it is usually carried; *b.* head of same from above.

the cheeks, its sides straight and parallel in front of the eyes, behind them suddenly narrowing but slightly convex to the short, very feebly excised occipital border. Mandibles rather long, with about 20 small, crowded and irregular teeth on the apical and several more indistinct teeth on the basal border. Clypeus bluntly carinate behind, its anterior border feebly emarginate or nearly straight in the middle. Antennæ slender, scapes surpassing the head by about $\frac{3}{5}$ of their length.

Thorax long and slender, pronotum longer than the mesonotum, which is longer than the epinotum; epinotal declivity only about $\frac{1}{3}$ as long as the base. Petiole small, its node blunt, with a feeble longitudinal impression on its summit, its anterior surface somewhat angulate near the base in profile, straight above and shorter than the straight, sloping posterior surface; ventral surface feebly convex behind. Gaster elliptical in non-replete individuals. Femora and tibiæ distinctly compressed.

Whole body, including the mandibles, subopaque, very finely and densely shagreened; mandibles with a row of coarse punctures along the apical margin.

Whole surface appearing pruinose, because covered with extremely fine, short, whitish pubescence. Hairs confined to mandibles and clypeus, where they are very short and mostly yellowish, and to the venter, where they are much longer and black. Flexor surfaces of tibiæ with an irregular row of short black bristles.

Black, with faint bluish or greenish reflections; head, antennæ, tarsi, trochanters, knees and tips of tibiæ rufotestaceous; palpi black.

New South Wales: Blue Mts. (Beccari and E. D'Albertis); Sydney (Lowne, L. M. D'Albertis); Katoomba, Blue Mts. (Wheeler); Jenolan Caves, Blue Mts. (J. C. Wiburd); Mittagong (W. W. Froggatt).

Queensland: Rockhampton (Froggatt); Peak Downs (Museum Godeffroy); Mackay (G. Turner).

This is the type of the genus. I have seen no specimens from Queensland, and suspect that some of the records, like that of Turner, may refer to *L. varians* var. *ruficeps*, which, owing to the great similarity in color, is very easily mistaken for *erythrocephalus*.

In his work on the ants of the Sicilian amber (1891) Emery describes and figures from some Queensland specimens what he takes to be the male of this species. A male received from Staudinger and Bang-Haas, from Cooktown on the Cape York peninsula, agrees with Emery's description but I hesitate to regard either it or the specimens described by Emery as males of *erythrocephalus*, because there are at least two other species in northern Queensland (*varians* and *unicolor*) to either of which they may be assigned with equal probability.

One small nest of *L. erythrocephalus*, which I found in the Kanimbla Valley, near Katoomba, was in the ground under the edge of a boulder. The gallery from the entrance descended only about four inches into the soil and there enlarged into a chamber about five inches long, three inches broad and an inch high. This contained about 60 workers with larvæ. Only six of the workers were in the replete condition.

2. **Leptomyrmex erythrocephalus** var. **mandibularis** var. nov.

Worker. Differing from the typical form in sculpture and color. The thorax, petiole, gaster, femora and tibiæ seem to be of a deeper black, because the pubescence is more scanty. The mandibles, clypeus, except its posterior border, frontal carinæ and antennal scapes are black; the anterior portion of the cheeks and a broad median streak on the gula are fuscous, the funiculi brown with reddish tips, the tarsi brown, the hind metatarsi somewhat darker. The surface of the body and head is distinctly smoother and more shining than in the typical form.

Described from a single specimen sent me many years ago by Mr. H. Ashton from the vicinity of Sydney, New South Wales.

3. **Leptomyrmex erythrocephalus** var. **decipiens** var. nov.

Worker. Length 7–8 mm.

Differing from the typical form and the foregoing variety in its smaller size and peculiar coloration. The head, thorax, petiole, coxæ, trochanters, knees, tibial spurs and tarsi are rufotestaceous, the gaster black, the femora and tibiæ dark brown, the tips of the antennal scapes more or less infuscated.

Described from nine specimens taken at Gin-Gin, Queensland and sent me many years ago by Mr. W. W. Froggatt. This variety, which at first sight may be easily mistaken for a form of *varians* or even more readily for *nigriventris* var. *tibialis*, is here referred to *erythrocephalus*, because the head has precisely the same shape and the femora and tibiæ are flattened as in that species, whereas the tibiæ are more slender and terete in *varians* and the head is more slender and conical behind. On the other hand, the head of *tibialis*, judging from Emery's description, seems to be even broader than in the typical *nigriventris*.

4. **Leptomyrmex erythrocephalus** var. **cnemidatus** var. nov.

Worker. Length 9 mm.

Differing from the var. *decipiens* only in the coloration of the legs and antennæ, the latter being rufotestaceous throughout, like the head, thorax and petiole, while the dark brown of the former is confined to

the tibiæ and the apical third or fourth of the femora. The black gaster has very pronounced metallic blue reflections.

A single specimen obtained several years ago from Staudinger and Bang-Haas. It is from New South Wales and was erroneously labelled "*L. rufipes* Emery."

5. **Leptomyrmex froggatti** Forel.

Forel, Rev. Suisse Zool. 18, 1910, p. 57 ♀ ♂; Froggatt, Agric. Gaz. N. S. W., Sept. 1905, p. 23; Emery, Genera Insect. Fasc. 137, 1912, p. 17.

"*Worker.* Length 8–9 mm.

"Mandibles a little shorter than in *erythrocephalus*, densely punctate and shagreened, subopaque, their terminal borders armed with 19 to 20 very distinct, crowded teeth. Clypeus impressed in front in the middle, straight behind its anterior border. Head as in the typical *erythrocephalus*, with the sides convex behind the eyes, much less narrowed than in *varians* Emery and its varieties, about twice as long as its anterior diameter. Eyes situated much further back than in *erythrocephalus*, towards the third fifth of the head. Antennæ a little shorter than in *erythrocephalus*, form of thorax similar, but somewhat less elongate. Petiole with a strong convexity below. It is more elongate behind the node, which is lower, not so thick, with its posterior surface more oblique and an antero-superior surface which is much shorter and a little more clearly marked off from a subtruncate antero-inferior surface. The legs are shorter.

"Deep blackish brown. Scapes, femora and petiole paler brown. Funiculi, border of mandibles, tarsi, sometimes the tibiæ, and in general the posterior third of the epinotum, the coxæ, bases of the femora and the lower portion of the thorax with the lower portions of its sides behind, testaceous. This color is almost the same as that of *varians* var. *rothneyi* Forel, but the latter has the head much narrowed behind and the legs and antennæ are much longer.

"*Male.* Length 7.7 to 8 mm.

"Mandibles elongate triangular, with obtuse tips. Scape shorter than the three first funicular joints together. Head like that of the worker, but narrower in front than behind the eyes. Pronotum forming a narrow and flat neck in front, to which the anterior convexity of the metanotum descends vertically; but the posterior raised third of the dorsum of the pronotum forms the lower portion of this sub-

vertical wall. Epinotum elongate; its basal subhorizontal face has posteriorly a large transverse impression. Declivity rather short, a little convex, very oblique, with two elevated stigmata above on the sides. Petiole without a distinct node, only more convex above than below. External genital valves with the form of an obtuse equilateral triangle (in *pallens* Emery, they have a long, narrow, curved appendage). On the other hand, one of the rami of the median valves is prolonged into a narrow style forked like a Y, the inferior branch of which is sharp and pointed like a needle.

"Sculpture, pilosity and pubescence as in the worker.

"Gaster nearly black; thorax, mandibles, femora and tibiæ brown. Declivity of epinotum, petiole and the remainder of body, including the head, yellowish testaceous. Wings brown, pubescent, having only the scapular and externo-median cells; all the others lacking; the nervures, however, without the appearance of atrophy.

"Certain workers are almost entirely black, like *unicolor* Emery, but this latter has a much broader and shorter head, which is concave behind, and the petiolar node is longer and lower; the epinotum is also shorter and more convex (with the appearance of a concavity on the basal surface as in the worker *froggatti*). *L. froggatti* is also allied to *niger* Emery, but this species has no teeth on the terminal border of the mandibles,[9] the head is much narrower behind and the petiole and epinotum have a different form. Finally, *nigriventris* Emery, (*recte* Guérin) has a broader head and higher node.

"New South Wales (Walcher), in wood."

I have not seen this species and have therefore translated Forel's description. It is cited by Froggatt from Noundoc, N. S. W.

6. **Leptomyrmex nigriventris** (Guérin).

(Fig. 6a and b.)

Formica nigriventris Guérin, Duperry, Voyage de Coquille, Zool. 2, 1830, p. 203, ♀ Pl. 8, Fig. 4;

Leptomyrmex nigriventris Emery, Ann. Mus. Stor. Nat. Genova, 24, 1887, p. 252 ♀ ; Dalla Torre, Catalog. Hymen. 7, 1893, p. 162 ♀ ; Ann. Soc. Ent. Belg. 39, 1895, p. 351 ♀ , fig.; Froggatt, Agric. Gaz. N. S. W.,

9 This statement is clearly contradicted by Emery's figure, which I have reproduced on p. 275.

Sept. 1905, p. 23; Emery, Genera Insect. Fasc. 137, 1912, p. 17; Stitz, Sitzber. Ges. Naturf. Freunde Berlin, 1912, p. 507 ♀.

Worker. Length: 9–12 mm.

Head, excluding the mandibles, less than twice as long as broad, rather robust, broadest just behind the eyes, the lateral borders in front of the eyes straight and slightly concave, behind the eyes convex and but slightly narrowed at the occipital border, which is broad and straight when the head is seen squarely from above. Eyes rather small, situated half way between the anterior border of the cheeks

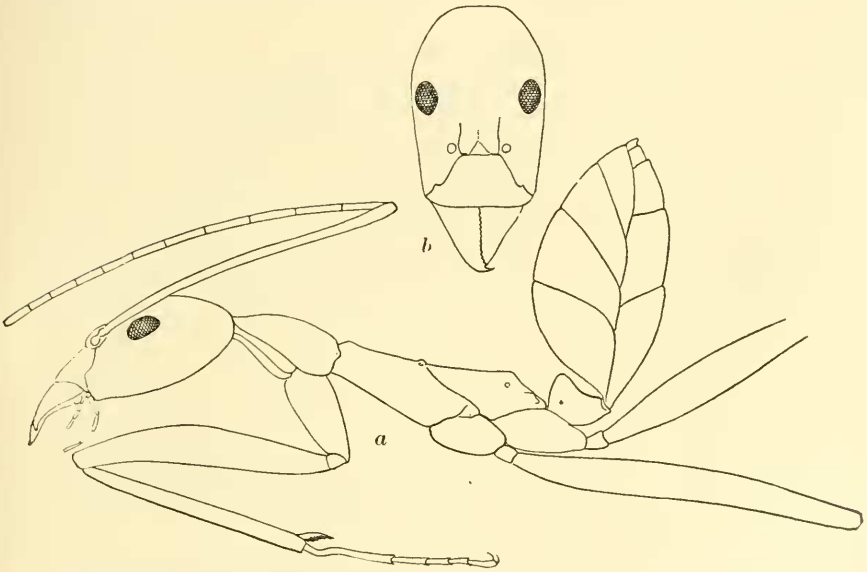

FIGURE 6. *a. Leptomyrmex nigriventris* Guérin, worker, with gaster in position in which it is usually carried; *b.* head of same from above.

and the posterior border of the head. Apical border of mandibles with about 20 crowded, irregular denticles. Anterior clypeal border impressed in the middle. Antennal scapes extending only a little over half their length beyond the posterior border of the head. Pronotum rather robust, only $1\frac{1}{2}$ times as long as broad. Base of epinotum somewhat concave in profile. Petiolar node rather high, its summit and anterior surface convex and rounded, with a distinct median longitudinal impression; posterior surface longer, concave. Gaster rather broad, elliptical. Femora and tibiæ distinctly compressed.

Subopaque, very finely and densely shagreened; mandibles slightly shining, coarsely punctate along the apical margin.

Pubescence extremely short and fine, less distinct than in *erythrocephalus*, covering the body and appendages. Hairs as in *erythrocephalus*.

Rufotestaceous throughout, except the gaster which is black, with bluish or greenish reflections.

New South Wales: Blue Mts. (Beccari and E. D'Albertis); Mt. Victoria (L. M. D'Albertis); Leura and Katoomba, Blue Mts. (Wheeler).

New Guinea: (Bürgers).

This is the largest of the species of *Leptomyrmex*. September 20 I found a fine colony in a large rotten *Eucalyptus* log near Katoomba. The nest cavity was in the center of the log and about five inches in diameter. It contained about 200 workers and many pure white larvæ. About one in six of the workers was in the replete condition. Each of these repletes, when the nest was disturbed, seized a larva and stalked out of the nest, and did not quicken its pace unless touched. A few workers on the road in a different locality near Katoomba were seen dragging an earthworm two and one half inches long to their nest.

The citation of this ant from New Guinea by Stitz seems to me to be very doubtful.

7. **Leptomyrmex nigriventris** var. **tibialis** Emery.

Emery, Ann. Soc. Ent. Belg. 39, 1895, p. 39 ♀ ; Genera Insect. Fasc. 137, 1912, p. 17; Froggatt, Agric. Gaz. N. S. W. Sept. 1905, p. 23.

Worker. Length 9–11.

Differing from the typical form in having the tibiæ more strongly compressed; and with both these and the tips of the femora black. The tint of the testaceous portions of the body is deeper. The head is a little broader in the largest individuals.

Northern Queensland (Podenzana).

8. **Leptomyrmex wiburdi** sp. nov.

(Fig. 7a and b).

Worker. Length 6.5–8 mm.

Resembling *erythrocephalus*, but smaller, and the head, excluding the mandibles, less than twice as long as broad. Cheeks distinctly con-

cave; head broadest just behind the eyes and more rounded behind than in *erythrocephalus* and *nigriventris*. Eyes large, as long as half their distance from the anterior border of the cheeks, situated a little more than half way from this border to the posterior border of the head. Anterior border of clypeus impressed in the middle. Mandibles rather slender, with about 20 crowded denticles on the apical border. Antennal scapes surpassing the head by less than $\frac{2}{3}$ their length. Thorax and petiole shaped much as in *nigriventris*, but the lower surface of the latter much more convex and the impression on the summit of the node very faint. Tibiæ distinctly compressed.

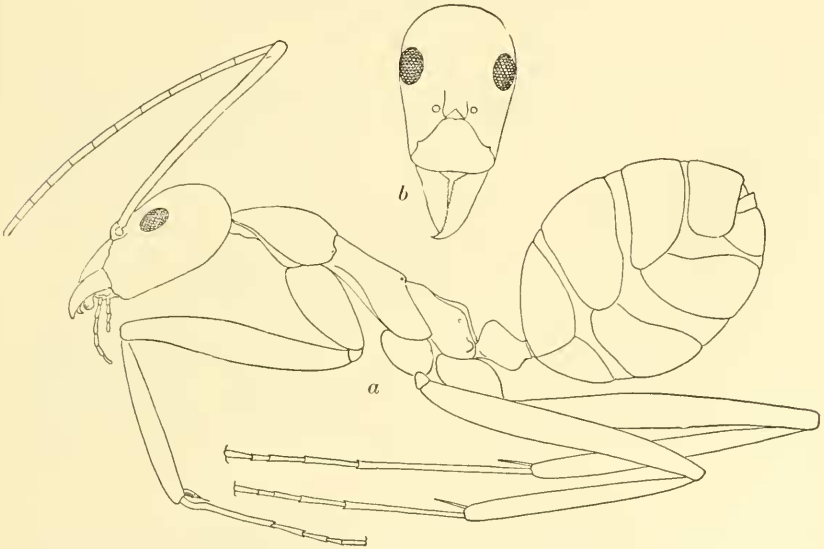

FIGURE 7. *a. Leptomyrmex wiburdi* sp. nov. Worker, nearly replete; *b.* head of same from above.

Subopaque, very finely and densely shagreened; mandibles slightly shining, coarsely punctate along the apical border.

Hairs very few, confined to mandibles, clypeus and venter. Pubescence extremely fine, giving the body a pruinose appearance, most distinct on the thorax and gaster.

Black, with bluish reflections; head, antennæ, trochanters, knees, tarsi and articulations of thorax yellowish testaceous; femora and tibiæ blackish brown, the latter often paler than the former. Palpi and a faint cloud on the vertex of the head fuscous.

Described from numerous specimens taken by Mr. J. C. Wiburd at

the Jenolan Caves in the Blue Mts. of New South Wales. The series comprises a number of repletes and larvæ showing that Mr. Wiburd took the colony from the nest. A single worker taken by myself in the Bulli Pass, New South Wales, agrees very closely with the types. It is difficult to decide whether *wiburdi* is a distinct species or merely an extreme variety or subspecies of *nigriventris*. For the present I prefer to regard it as a species characterized by small size, large eyes and the shape of the head, especially the concavity of the cheeks.

9. **Leptomyrmex wiburdi** var. **pictus** var. nov.

Worker. Length 7–8 mm.

Differing from the typical form in color, the thorax being yellowish red or testaceous, like the head, with a large black spot on the pronotum, a small one on the mesonotum and in some specimens also a still smaller or more indistinct one on the epinotum. The legs are red, with the apical $\frac{3}{4}$ of the femora black and all except the base and tip of the tibiæ dark brown or blackish. In some specimens the black spots on the dorsum of the thorax are more extensive and almost confluent and the outer surfaces of the coxæ are blackish or infuscated. Such specimens constitute transitions to the typical form.

Described from five specimens taken by myself in the Bulli Pass, New South Wales and a single one taken at Katoomba in the same state. The nest of this variety was not discovered and only specimens running about singly on the foot-paths were seen.

10. **Leptomyrmex niger** Emery.

(Fig. 8.)

Emery, Termesz. Füzet. 23, 1900, p. 333, Pl. 8, Fig. 43 ☿ ; Stitz, Stitzb. Ges. Naturf. Freunde Berlin, 1911, p. 367 ☿ ; Viehmeyer, Abhandl. Ber. k. zool. u. anthr. ethnogr. Mus. Dresden 14, 1912, p. 22, ☿ ; Emery, Genera Insect. Fasc. 137, 1912, p. 17.

Worker. Length 8 mm.

Head elongate, more than twice as long as broad, with slightly convex cheeks; posterior to the eyes, which are situated behind the middle of the sides, the sides are arcuately narrowed. Antennal scapes very slender, compressed. Petiole with a low rounded node, the an-

terior and posterior surfaces forming nearly a right angle with each other in profile.

Color brownish black; mandibles, funiculi and tips of tibiæ fusco-testaceous; tarsi pale yellow.

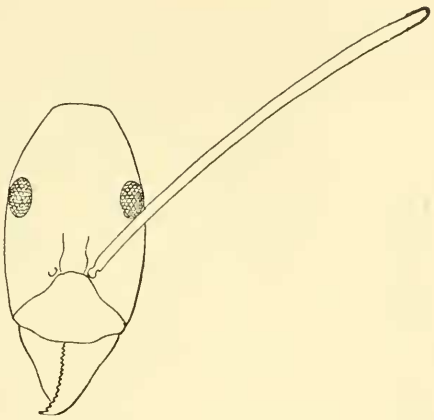

FIGURE 8. *Leptomyrmex niger* Emery. Head of worker after Emery.

German New Guinea: (L. Biró), Huongolf (Neuhaus).

As I have not seen this species I have translated and rearranged Emery's original description and reproduced his figure. The shape of the head is very characteristic and easily separates the species from *unicolor* which it closely resembles in color.

11. **Leptomyrmex fragilis** (F. Smith).

(Fig. 9.)

Formica fragilis F. Smith, Journ. Proc. Linn. Soc. Zool. 3, 1858, p. 136, ☿.

Leptomyrmex fragilis Emery, Ann. Mus. Stor. Nat. Genova, 38, 1897, p. 571, Pl. 1, Figs. 17 and 18, ☿ ♂; Viehmeyer, Abhand. ber. k. zool. anthr. ethnogr. Mus. Dresden 14, 1912, p. 22, ☿; Emery, Genera Insect. Fasc. 137, 1912, p. 15; Stitz, Sitzb. Ges. Naturf. Freunde, Berlin, 1912, p. 507, ☿ ♂.

"*Worker.* Length 6.5–7 mm.

"Head narrowed behind the eyes in the form of a cone and somewhat constricted at the occiput, where it is very narrow, a conformation which is more pronounced in this species than in *L. varians* Emery.

"Uniformly pale testaceous, often with an elongate brown spot on each side of the gaster.

"*Male.* Length 7–8 mm.

"Head rhomboidal, elongate, narrowed anteriorly and posteriorly. Mandibles linear, toothless, truncated at the tip. Pronotum bigibbous, with a median sulcus. Petiole growing broader posteriorly, twice as long as broad. Posterior femora and tibiæ flexuous. In the genital armature the stipes is simple and hairy, the volsella long, curved like a hook; between the stipes and volsella there projects a straight styliform lacinia, provided with a small, smooth appendage. In the fore wing the outer branch of the cubital is detached from its trunk.

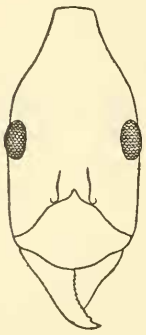

FIGURE 9. *Leptomyrmex fragilis* F. Smith. Head of worker after Emery.

"Yellowish testaceous; mandibles, antennæ, femora and tibiæ brown in some specimens; tarsi very pale. Wings smoky, with brown veins."

Aru Islands (A. R. Wallace).

British New Guinea: Moroka, Bujakori, Haveri, Paumomu River (L. Loria).

Ceram (Tauern).

I have here translated Emery's brief description and reproduced his figure of the head of the worker. This phase was rather vaguely described by Smith. Emery's figure shows that the species is closely related to *pallens* and *varians*. It may, however, be readily distinguished by the more constricted occiput and the pale color of the gaster, which in all the other known species is largely or entirely black or very dark brown.

12. **Leptomyrmex pallens** Emery.

(Fig. 10.)

Emery, Bull. Soc. Ent. Ital. 15, 1883, p. 147, ♀ Fig.; Ern. André, Rev. d'Ent. 6, 1887, p. 290 ♂; Froggatt, Agric. Gaz. N. S. W. Sept. 1905, p. 23; Stitz, Sitzb. Ges. Naturf. Freunde Berlin, 1911, p. 368 ♂;

ibid. 1912, p. 507 ♀ ; Emery, Genera Insect. Fasc. 137, 1912, p. 17; Viehmeyer, Abhand. Ber. zool. anthr. ethnogr. Mus. Dresden, 14, 1912, p. 22 ♀ ; Emery, in Sarasin and Roux, Nova Caledonia, 1, 1914, p. 418.

Worker. Length 6–7.5 mm.

Head, excluding the mandibles fully twice as long as broad; in front of the eyes with straight, subparallel sides, behind the eyes conical and narrowing rapidly but without constriction to the short, straight, occipital border. Antennæ very slender, the scapes surpassing the head by about $\frac{3}{4}$ their length. Thorax slender; pronotum nearly twice as long as broad; epinotum rather short, its base feebly convex and only twice as long as the declivity. Petiole small, its anterior and posterior surfaces rather straight, its blunt summit very feebly impressed in the middle. Gaster broadly elliptical; legs very slender; tibiæ not compressed.

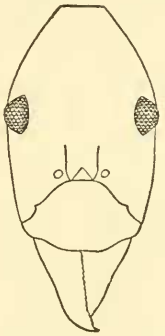

FIGURE 10. *Leptomyrmex pallens* Emery. Head of worker.

Surface of body slightly shining, very finely and densely shagreened. Mandibles with a single row of coarse punctures along the apical border.

Hairs very feebly developed as in the other species; pubescence white, extremely fine, so that the surface is scarcely pruinose.

Pale rufotestaceous; gaster brownish black.

Male. Length 7 mm.

Rufotestaceous throughout, except the black eyes and the ocellar orbits and articulations of the wings which are brownish black. Body slightly shining, extremely finely and superficially shagreened. Pubescence and pilosity almost absent. Wings slightly smoky, with brownish veins.

New Caledonia: Oubatche, Yambé, Hienghiéne, Coné, Canale, Valley of the Négropo, Coindé, La Foa, Valley of Ngoi, Yaté, Nouméa (Sarasin and Roux).

Loyalty Islands: Ouvea, Fayaoué (Sarasin and Roux).

German New Guinea (Lauterbach).

Dutch New Guinea: Tana (Moszkowski).

This species, of which I have examined two worker specimens received from Professors Emery and Forel, is very similar to *L. varians* but is smaller and the head is less elongated and not constricted at the occiput. The description of the male is taken from Ern. André.

13. **Leptomyrmex pallens** var. **geniculatus** Emery.

Emery, in Sarasin and Roux, Nova Caledonia, Zool. 1, 1914, p. 418, ☿.

Worker. Differing from the typical form in color, the body being pale rufotestaceous, except the two first segments of the gaster and the distal halves of the femora, which are black.

New Caledonia: Tchalabel, Coula-Borearé (Sarasin and Roux).

I have examined a cotype of this variety kindly sent me by Prof. Emery.

14. **Leptomyrmex pallens** var. **nigriceps** Emery.

Emery, in Sarasin and Roux, Nova Caledonia, Zool. 1, 1914, p. 418, ☿.

Worker. Head, except the mandibles, and the whole gaster black; remainder of body and appendages rufotestaceous.

New Caledonia: La Madelaine (Sarasin and Roux).

Emery states that this variety makes its nests under stones and that Roux found "individuals having the gaster distended with a transparent liquid," in other words, repletes.

15. **Leptomyrmex varians** Emery.

L. varians Emery, Ann. Soc. Ent. Belg. 39, 1895, p. 351, 352, ☿ Fig.; Froggatt, Agric. Gaz. N. S. W., Sept., 1905, p. 23; Emery, Genera Insect. Fasc. 137, 1912, p. 17.

L. erythrocephalus Mayr (in part.) Journ. Mus. Godeffroy, 12, 1876, p. 77.

Worker. Length 8.5–10 mm.

Head, excluding the mandibles, fully twice as long as broad; the sides in front of the eyes nearly straight and parallel, behind the eyes rapidly contracting to the narrow straight occipital margin, just in front of which on each side, the border is concave. Eyes rather small and convex, half way between the anterior border of the cheeks and the occipital border. Antennæ very slender, scapes terete, extending somewhat less than $\frac{2}{3}$ their length beyond the posterior border of the head. Pronotum slightly more than $1\frac{1}{2}$ times as long as broad. Epinotum in profile with concave base, about twice as long as the

very convex declivity. Petiole triangular in profile with straight anterior and posterior surfaces meeting at somewhat less than a right angle; summit of node with a distinct longitudinal impression. Gaster elliptical, rather narrow. Legs very slender, tibiæ not compressed.

Subopaque, very finely shagreened; mandibles with a row of coarse punctures along their apical border.

Hairs on mandibles and clypeus very feebly developed, longer, coarser and black on the venter; pubescence whitish, extremely short and fine.

Head, thorax and antennæ, rufotestaceous; gaster, pronotum, and in some specimens a spot on the mesonotum black; legs black; tarsi fulvous.

Queensland: Rockhampton (Museum Godeffroy);

This species is very closely related to *pallens* but differs in its greater size and the more elongate and posteriorly constricted head. I have not seen specimens of the typical form but of the following varieties:

16. **Leptomyrmex varians** var. **rufipes** Emery.

Emery, Ann. Soc. Ent. Belg. 39, 1895, p. 352, ☿ ; Forel, Rev. Suisse Zool. 10, 1902, p. 473, ☿ (replete); Froggatt, Agric. Gaz. N. S. W. Sept. 1905, p. 23; Emery, Genera Insect. Fasc. 137, 1912, p. 17; Boll. Lab. Zool. Gen. e Agrar. R. Scuola Sup. d'Agric. Portici 8, 1914, p. 180.

Worker. Differing from the typical form of the species in color. The gaster and distal halves of the femora are black; the remainder of the body, including the anus and a spot at the base of the first gastric segment rufotestaceous.

Queensland: Laidely, Brisbane (Podenzana); Mackay (G. Turner); Darra, Toowong and Botanical Garden, Brisbane (Wheeler).

New South Wales: Gosford (F. Silvestri).

According to Forel, Gilbert Turner discovered the repletes of this variety at Mackay. I found two nests, both in the ground in dry woods, one at Toowong, and the other at Darra, but was unfortunately unable to excavate them. The one at Toowong was under the root of a large tree in very hard, stony soil, that at Darra under a large log in which an extremely irritable colony of wasps (*Icaria socialistica*) was nesting. When the log was turned over these insects compelled Mr. Henry Hacker and myself to beat a hasty retreat.

17. **Leptomyrmex varians** var. **ruficeps** Emery.

(Fig. 11).

Emery Ann. Soc. Ent. Belg. 39, 1895, p. 352 ♀ ; Froggatt, Agric. Gaz. N. S. W. Sept. 1905, p. 23; Emery, Genera Insect. Fasc. 137, 1912, p. 17; Boll. Lab. Zool. Gen. e Agrar. R. Scuola Sup. d'Agric. Portici 8, 1914, p. 180.

Worker. Differing from the typical form and preceding variety in color. The head and antennæ are yellowish testaceous; the thorax, gaster and femora black; the tibiæ, tarsi and anal orifice pale yellow.

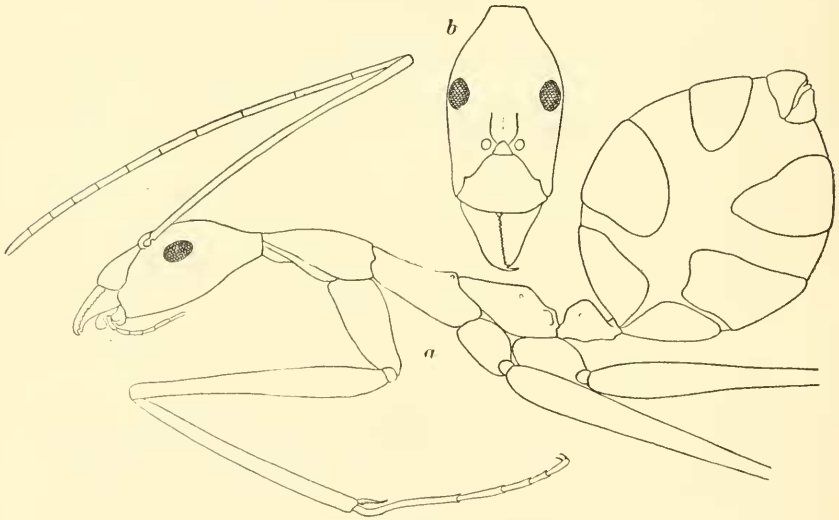

FIGURE 11. *Leptomyrmex varians* Emery, var. *ruficeps* Emery, replete worker; *b*. head of same from above.

Queensland: Mt. Bellenden Ker (Podenzana); Cairns (Froggatt); Kuranda (Wheeler).

New South Wales: Katoomba, Blue Mts. (F. Silvestri).

I found this variety to be very common in the vicinity of Kuranda, where it may be seen stalking about singly on almost any of the shady paths in the tropical "scrub." The following notes on three nests which I examined may be of interest in connection with the remarks on behavior in the introduction to this paper:

October 19 I found a nest in a hollow log nearly 50 feet long that was lying in the shade. The ants were entering the log by a large opening. On breaking into it, I found that the cavity extended through the more decomposed, central wood to such a distance that I could introduce my whole arm into it. The colony comprised about 200–300 workers, only the ordinary forms of which rushed out of the nest when it was first broken open. The numerous repletes took refuge at the blind end of the cavity where they hung from the ceiling. On thrusting my tweezers among them, many came out, each carrying a larva or pupa. Later both repletes and many of the ordinary workers found that they could go deeper into the log where I could not reach them. I estimated one replete to about 25 or 30 of the ordinary workers. On returning to this nest a few hours later I found that nearly all the ants had gone back to their nest and that only a few were outside the entrance looking through the débris for lost larvæ and pupæ.

On October 24 two other colonies of *ruficeps* were found in the same locality. One of them was in the center of a large rotten log, which the ants entered at one end by an opening fully eight inches across. The cavity ran back a distance of fully two feet, preserving this same diameter. When the nest was disturbed most of the ants retreated to the blind end of the cavity where I could reach them only with a stick. When this was thrust among them, numerous repletes, each carrying a larva or pupa in its jaws, came to the entrance.

The second nest was a more fortunate discovery. On accidentally kicking off the upper half of a large and very rotten log for a distance of about two feet, I found that I had opened a large *ruficeps* nest. The ants were mostly on the ceiling of a large cavity and comprised fully 300 ordinary workers and at least 50 repletes, every one of which was holding a larva or pupa in its jaws.

I observed that *ruficeps* workers, on the approach of evening, often carry each other back to the nest. I have not noticed this habit in other Dolichoderinæ, though it is common in many Myrmicinæ and Camponotinæ. On several occasions *ruficeps* was seen carrying caterpillars and dead ants to its nest. The repletes, as stated on p. 260 occasionally leave the nest.

18. **Leptomyrmex varians** var. **rothneyi** Forel.

Forel Rev. Suisse Zool. 10, 1902, p. 473 ♀ ; Froggatt, Agric. Gaz. N. S. W. Sept. 1905, p. 23; Emery, Genera Insect. Fasc. 137, 1912, p. 17.

Worker. Length 11 mm.

Head a little broader at the level of the eyes than in front; contracted behind in the form of a cone, which is narrower and quite as long as in the typical *varians* and the preceding varieties. Antennal scapes surpassing the head by about $\frac{2}{3}$ their length. Gaster brown; head and thorax presenting a mixture of pale brown and yellowish red; femora pale brown; tarsi and tibiæ pale yellow; antennæ yellowish red.

Queensland: Brisbane (Rothney).

I refer to this variety, of which I have translated Forel's description, a single specimen found running on the ground in dry woods at Enoggera, near Brisbane, Queensland. The mandibles, cheeks and mouth-parts, the pleuræ and whole epinotum, except a large spot on its dorsal surface, the anal segment, antennæ, tibiæ and tarsi are yellowish testaceous, the remainder of the body brown, the gaster more blackish.

19. **Leptomyrmex unicolor** Emery.

(Fig. 12.)

Emery, Ann. Soc. Ent. Belg. 39, 1895, p. 351, 352, ♀ Fig. ; Froggatt, Agric. Gaz. N. S. W., Sept. 1905, p. 23; Emery, Genera Insect. Fasc. 137, 1912, p. 17.

Worker. Length 7–8.5 mm.

Head, excluding the mandibles, not more than $1\frac{1}{2}$ times as long as broad, broadest at the level of the eyes, convex in the frontal region, flattened beneath; sides behind the eyes rather straight and converging to the broad, straight occipital border. Eyes about half way between the anterior borders of the cheeks and the posterior border of the head. Mandibles moderately long, with about 20 small, crowded teeth on the apical and several distinct teeth on the basal border. Antennal scapes slender, distinctly flattened, surpassing the head by nearly $\frac{3}{5}$ their length. Thorax rather short, pronotum less than $1\frac{1}{2}$ times as long as broad; base and declivity of epinotum subequal, passing into each other through a very rounded angle. Petiole narrow, with a low, rounded node, with subequal anterior and posterior slopes, the former feebly convex, the latter straight in profile, the ventral surface only feebly convex. Gaster slender, more than three times as long as broad. Legs slender; tibiæ very slightly flattened.

Subopaque very finely and densely shagreened; mandibles smooth and shining along their apical borders and at the tips, with a few coarse punctures.

In addition to the pilosity on the clypeus, mandibles and venter, there are also prominent black hairs on the coxæ, and the scapes and legs are covered with abundant, minute, oblique black hairs. Eyes distinctly hairy.

Body, femora and tibiæ black, with bluish or greenish reflections; antennal scapes black, with their apical third or fourth brown; mandibles and labium brownish yellow, the former with a fuscous spot or

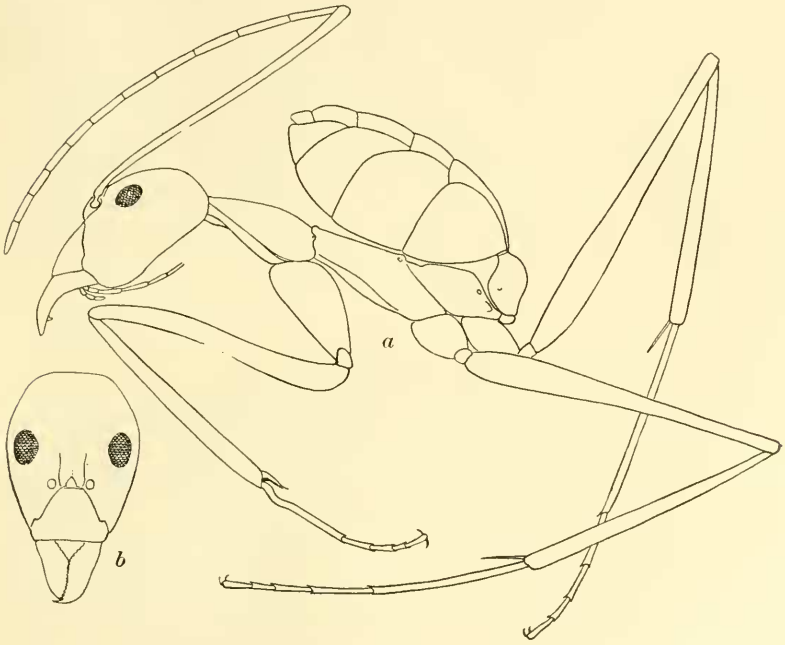

FIGURE 12. *a. Leptomyrmex unicolor* Emery, worker, with gaster in the position in which it is usually carried; *b.* head of same from above.

cloud at the base on the external margin; metatarsi of all the feet white; remaining tarsal joints, tibial spurs and the antennal funiculi fulvous.

Queensland: Cairns (Podenzana); Kuranda (Wheeler).

This species is very easily recognized, as it differs from all the others in the shape of the head and gaster, in color and pilosity, the position in which the gaster is carried during life, the structure of the larval

head, etc. Though less abundant than *varians* var. *ruficeps* at Kuranda, it is nevertheless very common in that locality, where it is confined to the shady tropical scrub. The nests, however, are not easily found. October 21 I followed a worker *unicolor*, that was carrying a small white moth, for a distance of nearly 50 feet along a dark path in the scrub, till the nest was located as a large hole under the roots of a great fig tree. These prevented excavation, but I was able to run a stick into the cavity for a distance of 18 inches, when many of the repletes poured out, indicating that I had penetrated to the end of the nest. October 28 I discovered two nests which were accessible in red rotten logs. The first contained only 50 workers, but many young larvæ. The other colony occupied a large cavity fully two feet long and several inches broad in the heart of the log. This colony comprised fully 250 or 300 workers, with numerous larvæ and pupæ, apparently all of the worker phase. In both these nests the larvæ and pupæ were on the floor of the cavity till the ants were disturbed, when they seized them in their jaws and huddled together on the ceiling. In none of the nests of this species were there any repletes.

Postscript.

Since the foregoing account of the species of *Leptomyrmex* was sent to the press, Forel has published an important contribution to our knowledge of the Australian ant-fauna (Results of Dr. E. Mjöberg's Swedish Scientific Expeditions to Australia 1910–1913, 2. Ameisen, Arkiv för Zool. 9, 1915, pp. 1–119, 3 pls., 6 text-figs.), containing descriptions of a new species and new variety of *Leptomyrmex* and of the hitherto unknown male of *L. varians* var. *ruficeps*. For the sake of completeness, I include a translation of these descriptions:

Leptomyrmex varians Emery var. ruficeps Emery.

"*Male*. Length 7.5–7.7 mm.

Entirely pale reddish yellow; wings feebly suffused with yellow and with brownish yellow veins. The narrow head is contracted anteriorly and posteriorly and nearly $2\frac{1}{2}$ times longer than broad in the middle. The large convex eyes lie in the middle and occupy nearly $\frac{1}{3}$ of the whole head. Antennal scape shorter than the long second funicular joint. First funicular joint as broad as long. The

mesonotum in front nearly overarches the pronotum, from which it is separated by a deep constriction. The whole thorax is cylindrical. The declivous surface of the epinotum is not half as long as the basal surface; the two stigmata form a sharp angle between the two surfaces. Surface lustrous and pubescent, without erect hairs except on the venter."

Leptomyrmex erythrocephalus var. rufithorax Forel.

"*Worker.* Length 9–10.7 mm.

Entirely like the type of the species, but with the whole thorax red and not only the head. Legs, petiole and gaster brownish black."

Queensland; Mt. Tambourine (E. Mjöberg).

Leptomyrmex mjöbergi Forel.

"*Worker.* Length 5.3–6 mm.

Head fully twice as long as broad. Clypeus ecarinate, with nearly straight anterior border (scarcely convex, without a lobe). The eyes are feebly convex and lie somewhat behind the middle of the sides of the head. Behind them the head is distinctly but gradually narrowed, and with convex lateral margins and has behind a narrow but distinct occipital border, which is rather concave than convex (much as in *erythrocephalus*). The antennal scape surpasses the occipital border by $\frac{3}{5}$ of its length. Thorax between the base of the epinotum and the promesonotum distinctly constricted. The promesonotum is very feebly but uniformly convex, distinctly lower than the basal surface of the epinotum, and this surface is twice as long as the declivity. The petiole is rather strongly inclined forward, nearly twice as high as long and has about the form of an anteriorly inclined parallelopipedon, which is, however, somewhat convex above and with flat, but anteriorly inclined anterior and posterior surface.

Surface of body moderately shining, throughout finely and superficially shagreened, with delicate, short and sparse pubescence and without erect hairs.

Black; femora, scapes and tibiæ brown; mandibles reddish brown; tarsi reddish yellow.

Queensland; Colosseum, Tolga, Herberton (E. Mjöberg).

This, the smallest species of the genus, with its entirely black body

and relatively high, thin petiole, is totally different from the other known species."

The following forms were also taken by Mjöberg in Queensland:

L. varians Emery var. *rothneyi* Forel ♀ — Blackal Range.

L. varians Emery var. *rufipes* Emery ♀ — Blackal Range.

L. varians Emery var. *ruficeps* Emery ♀ — Glen Lamington, Logan Village, Atherton, Malanda, Cedar Creek, Herberton. Forel, on the authority of Mjöberg, says that this species is called the "sugar ant" by the Australian colonists. This is an error, as the "sugar ant" is *Camponotus nigriceps* F. Smith.

L. nigriventris Guérin var. *tibialis* Emery. ♀ — Mt. Tambourine.